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Promoting and Improving the Fermentation of Wine, Beer, &c.

LETTERS PATENT to Frank Wirth of the Firm of Wirth and Company Patent Solicitors at Frankfort on the Main in the Empire of Germany for an Invention of "IMPROVEMENTS IN THE MEANS FOR PROMOTING AND IMPROVING THE FERMENTATION OF WINE, BEER, AND OTHER BEVERAGES" a communication from Adolph Reihlen, a person resident at Stuttgart in the Empire of Germany

PROVISIONAL SPECIFICATION left by the said Frank Wirth at the Office of the Commissioners of Patents on the 4th July 1883.

FRANK WIRTH, of the firm of Wirth and Company, Patent Solicitors, at Frankfort-on-the-Main, in the Empire of Germany "IMPROVEMENTS IN THE
5 MEANS FOR PROMOTING AND IMPROVING THE FERMENTATION OF WINE, BEER, AND OTHER BEVERAGES" [A communication from Adolph Reihlen, a person resident at Stuttgart in the Empire of Germany]

This invention relates to the preparation and use of fibres for promoting fermentation in wine, beer, and other beverages and is based upon the fact that
10 not only do woody fibres and vegetable cellular substances in their minutest form become impregnated with fungoid growths when they are in contact with substances in a state of fermentation, but they may also be impregnated with the same growths deriving their germs direct from the air under favourable conditions. The fibres impregnated with the said fungoid growths may be used
15 as ferment instead of yeast but without the disadvantages attending the use of the same, and for fermentations of all description.

According to the process heretofore in use fermentation was promoted by the addition of yeast to sugar containing liquids. The quality of the products of fermentation is dependent upon the action of this yeast which contains always
20 a varied quantity of fungoid growths some of which are diseased. This disadvantage is of particular importance in the brewing of beer, as the nitrogenous substances of the yeast are added to the nitrogenous substances of the wort, whereby the formation of diseased fungoid growths is promoted

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The difficulty of always obtaining yeast of superior quality is the best proof of this fact

According to the present invention I pour sugar containing pasteurized beer over clean woody fibres or cellulose, at a temperature suitable for fermentation, the fungoid growths, which develop in the fermentation of beer deriving further 5 germs from their contact with the air are thus multiplied.

In the same manner the fungoid growths in a clean sugar-containing and pasteurized wine placed under the same conditions as above are likewise multiplied.

The yeastless taste possessed by beverages which have been fermented by means 10 of the said fungoid growths derived from the air is fully confirmed by microscopical researches. Nitrogenous liquids such as wort, must and the like were heretofore not apt for obtaining such a result.

Although all kinds of woody fibres have been found capable of receiving the fungoid growths promoting fermentation, those fibres answer best which offer the 15 greatest surface for the finest distribution of the said fungoid growths. Grated wood, paper, cotton, wool, flax, hemp, and the like (whether woven as fibre or in the form of pulp) wood, saw-dust of every description chopped hay, the skins of fruits, such as grapes, and apples, the skin of hops, potatoes and the like. To render the skins of fruits or vegetable efficient they must in all cases be freed 20 from their juice by means of washing and cooking, the fibres thus obtained which are firm like wood being grated afterwards into dust

Fibres which are of a bad taste will not answer for beverages, beer is evidently the material requiring the cleanest and especially the lightest of yeast.

For the purpose of fermenting beer wort, it is necessary:—(1) to select suitable 25 vegetable substances as feeding ground for the fungoid growths (2) to fix these fungoid growths upon the material selected. (3) to ferment the wort with fibres thus prepared amongst the materials which can be used. The one to be preferred is that which is the cheapest in proportion to its quality, and which can be easily cleaned in order to be used again, the following will answer the 30 purpose; woody material obtained from non-resinous trees or from straw, or next the skins of hops or of grapes which have been used in the manufacture of wine; saw dust from non-resinous wood, or chopped hay and the like. Cotton wool which has not been in use, tow, aloe and ochreous fibres are not favourable materials to use, as the yeast which settles upon these fibres cannot be separated so well from 35 the same as from the stuffs woven from such fibres.

The fixing of the fungoid growths is the same for all materials, and although many of the above materials may be clean enough to receive the said fungoid growths, it is advisable that they should be preparatively boiled with water, this operation being performed from time to time for preparing the same material again 40 for further fermentations, which is an advantage. The fibres being then freed by pressure from the water which they may retain, a sugar containing, pure and pasteurized beer is poured over them, in order to cover the said fibres, when a favourable temperature has been attained, fermentation sets in which occurs generally after a lapse of about from 12 to 15 hours. 45

The microscope is used to ascertain when the right fungoid growths have been formed over the surface of the liquor.

It is essential for the production of these fungoid growths, that the pasteurized beer used should contain as few nitrogenous substances as possible; on this account the beer hereinafter described, obtained from very concentrated wort 50 several times filtered and containing the purest sugar, is employed. Ordinary pasteurized beer mixed with sugar or maltose may also be used although it is inferior to the above.

When sound fungoid growths have been formed in the above described manner upon the fibres, fermentation commences and is increased by the addition of 55 pasteurized beer and of clean fibres. It is better but not necessary that fermentation should take place in closed vats. A temperature of from 15 to

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20 degrees Celsius will be sufficient for a rapid increase of the fungoid growths. It is sufficient in order to increase the fungoid growths to take wort which is filtered pasteurized and the sugar of which is about two thirds fermented. This wort will be hereinafter described.

- 5 Good fermenting fibres can be taken from the vats as required

Beer yeast may also be employed for the deposit of healthy fungoid growths upon the clean fibres; it is preferable, however, not to resort to this practice, as fungoid growths deriving their germs from the air are lighter and cleaner than any other.

- 10 When it is desired to ferment wines, fruit-wines, champagne or effervescing beverages by means of the said fermentation fibres, the process is the same, that is to say, the sugar containing wine, fruit wine or the liquid which is to be fermented, is poured over the vegetable fibres and when a suitable temperature is obtained as above stated the wine fungoid growths are formed in the same manner as the beer
15 fungoid growths and the fibres can be used for fermenting any of these liquids. The use of these fibres need not further be described, as effervescing beverages are generally fermented with the same partly in vessels and partly in their own bottles as is the case in the manufacture of artificial mineral waters.

- The separation at the proper time of this ferment is more easily performed by
20 using a small bag than in the ordinary manner above described

- The fermentation of the wort may be effected with a small or a large quantity of the above described ferment, as has heretofore been the case when using yeast; it has been found by experience that a quantity of compressed fibres equal to 1 per cent of the weight of the wort employed is a small quantity whereas
25 10 per cent is a rather large one, although neither of these two quantities have given rise to any inconvenience, however from 2 to 4 per cent is about the right quantity to use. It is of great importance that the fermentation should commence quickly so that the wort should not deteriorate

- Towards the end of the process the proper quantity of ferment is added with
30 from four to six times its weight of wort, the wort having been cooled down to from 30 to 24 degrees Celsius. When after a few hours, an active fermentation has commenced, the rest of the wort cooled down to 5° or 6° Celsius is added to the mass.

- The period of time required to accomplish this fermentation process is (independent of the time taken for the filtration of the wort as hereinafter described), the same as for the fermentation by means of yeast, the temperature being also the same, as the sugar is being decomposed the new ferment causes the heavy yeast to precipitate at the bottom; at a low temperature of fermentation the latter
35 remains two or three days before it is decomposed. The removal of this newly
40 formed yeast before its own decomposition commences is of great importance with regard to the purity and good taste of the beer, and consequently filtration is the operation which fulfils best this object: When the beer is simply fermented by this process but not filtered, it is purer and better than that fermented by ordinary methods, (but the removal of the yeast or deposit by filtration renders it still
45 better, more brilliant and durable, effects a saving in the quantity of ice required for cooling and takes moreover a shorter time for fermentation than heretofore.

- The yeast or deposit which settles partly upon the fermentation fibres is advantageously (but not necessarily) washed away with the filtered wort in part
50 fermented from the said fibres, the mash is then filtered, and the clean beer obtained is fermented anew with the clean fibres. The proper time at which this cleaning should be effected is when from 3 to 4 per cent of the sugar is decomposed.

- The principle of employing a non-nitrogenous ferment and promptly expelling
55 all nitrogenous substances which may separate, furnishes a brilliant fermentation and consequently gives very good results.

The next advantage results from being able to carry out the fermentation of the

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clean fermenting wort at a higher temperature than heretofore without any disadvantage being attached to it.

Highly concentrated worts after a further decomposition of about 3 per cent of sugar can be refiltered, that is to say, the nitrogenous substances which have meanwhile separated can be further removed. It is advantageous in carrying out the above described process to raise the temperature of fermentation to from 10° to 15° Celsius and to reduce the time allowed for fermentation to five days. 5

Another result of the above described cleaning is that the fermented beer clears quicker, becomes more brilliant, sparkles much more, retains its carbonic acid much longer when poured out than heretofore in a glass and is on account of its purity and durability very suitable for export. As soon as the areometer shews that a suitable specific gravity has been obtained, the fermentation fibres are promoted, and the further decomposition of sugar can be easily removed by placing the washed fermentation fibres in a suitable bag, this bag being subsequently immersed in the filtered fermenting beer. These fibres float, being supported by the evolution of carbonic acid, whereas the nitrogenous substances produced and which are separated by this ferment sink to the bottom. 10 15

The fermentation fibres which are fairly clean under these circumstances may in the majority of cases be forthwith used in the fermentation of fresh wort as the first fungoid growths produced can be used for several fermentations and only require a new formation from time to time. 20

The above mentioned filtration which is performed by a filtering press, allows any quantity of wort to be easily cleaned and at the same time used for the precipitation of yeast, for any other purposes. When the wort is concentrated so as to contain from 25 to 30 per cent of sugar, and 3 or 4 per cent of that sugar is decomposed by the new ferment, the yeast is filtered off, concentrated wort is further added, fermented, and filtered; this is repeated several times as above stated when at the end of the operation and at a high temperature a beer still fermenting is obtained which is extremely pure, brilliant and sparkling, and which on account of the great quantity of spirits of wine which it holds contains still a large quantity of sugar. This beer diluted with water may serve advantageously for the formation upon the fibres of the fungoid growths, the germs of which are derived from the air. 25 30

In the use of this principle, that is to say, the precipitation of the yeast containing substances by fermentation, it is necessary that this deposit should be removed by repeated filtration before these substances are decomposed; further fermentation with fibres has been found highly advantageous for the must of wines and fruits, these musts can be completely fermented with the use of the fibres and more or less wine can be produced for bottling. 35

These fermentation fibres may be most advantageously used to easily referment either diseased wine with the addition of sugar containing wine concentrated must or sugar or diseased beer with the addition of wort and afterwards clarifying the same by the said fermentation 40

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SPECIFICATION in pursuance of the conditions of the Letters Patent filed by the said Frank Wirth in the Patent Office on the 3rd January 1884.

FRANK WIRTH, of the firm of Wirth and Company, Patent Solicitors, at Frankfort-on-the-Main in the Empire of Germany "IMPROVEMENTS IN THE
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10 not only do woody fibres and vegetable cellular substances in their minutest form become impregnated with fungoid growths when they are in contact with substances in a state of fermentation, but they may also be impregnated with the same growths deriving their germs direct from the air under favourable conditions. The fibres impregnated with the said fungoid growths may be used as ferment
15 instead of yeast but without the disadvantages attending the use of the same, and for fermentation of all description.

According to the process heretofore in use, fermentation was promoted by the addition of yeast to sugar containing liquids. The quality of the products of fermentation is dependent upon the action of this yeast which contains always a
20 varied quantity of fungoid growths some of which are diseased. This disadvantage is of particular importance in the brewing of beer, as the nitrogenous substances of the yeast are added to the nitrogenous substances of the wort, whereby the formation of diseased fungoid growths is promoted.

The difficulty of always obtaining yeast of superior quality is the best proof of
25 this fact.

According to the present invention I pour sugar containing pasteurized beer over clean woody fibres or cellulose. At a suitable temperature for fermentation, the fungoid growths, which develop in the fermentation of beer, deriving further germs from their contact with the air, are thus multiplied. In the same manner the
30 fungoid growths in a clean sugar containing and pasteurized wine, placed under the same conditions as above described, are likewise multiplied.

The absence of taste of yeast in beverages which have been fermented by means of the said pure fungoid growths derived from the air is fully confirmed by microscopical researches. Nitrogenous liquids such as wort, must, and the like,
35 are not serviceable for obtaining such a result.

Although all kinds of woody fibres have been found capable of receiving fungoid growths promoting fermentation, those fibres answer best which offer the greatest surface for the finest distribution of the said fungoid growths. Grated wood, paper, cotton, flax, hemp and the like, whether as fibre or in the form of
40 pulp; wood, saw-dust of every description, chopped hay, the skins of fruits, such as grapes, and apples and the skin of hops potatoes, and the like. To render the skins of fruits or vegetables efficient they must in all cases be freed from their juice by means of washing and cooking, the fibres thus obtained which are firm like wood being grated afterwards into dust.

Fibres which have a bad taste will not answer for beverages; beer is evidently the material requiring the cleanest or purest yeast, which can be obtained so easily everywhere.

For the purpose of fermenting beer wort it is necessary to select suitable vegetable substance as feeding ground for the fungoid growths, and then to fix
50 these fungoid growths upon the material selected

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Amongst the materials which can be used the one to be preferred is that which is the cheapest in proportion to its quality, and which can be easily cleaned in order to be used again; the following will answer the purpose; woody material obtained from non-resinous trees or from straw, or next the skins of hops, or of grapes which have been used in the manufacture of wine; saw-dust from non-resinous wood, or chopped hay and the like. Cotton which has not been in use, tow aloe and ochreae fibres are not favourable materials to use, as the yeast which settles upon these fibres cannot be separated so well from the same as from the materials woven from such fibres. 5

The fixing of the fungoid growths is the same for all materials, and although many of the above mentioned may be clean enough to receive the said fungoid growths, it is advisable that they should be preparatively boiled with water, this operation being performed from time to time to prepare the same material again for further fermentations which is an advantage. The fibres being then freed by pressure from the water which they may retain, a sugar containing pure and pasteurized beer is poured over them, in order to cover the said fibres. When a favourable temperature has been attained fermentation commences generally after a lapse of about from 12 to 15 hours. The microscope proves that the real fungoid growths have been formed. 10

It is essential for the production of these fungoid growths that the pasteurized beer used should contain as few nitrogenous substances as possible; on this account the beer hereinafter described obtained from very concentrated wort several times filtered and containing the purest sugar is employed. 15

Ordinary pasteurized beer mixed with sugar or maltose may also be used although it is inferior to the above. 25

When sound fungoid growths have been formed in the above described manner upon the fibres, fermentation commences, and is increased by the addition of pasteurized beer and of clean fibres. It is advantageous (but not necessary) that fermentation should take place in closed vats. A temperature of from 15 to 20 degrees Celsius will be sufficient for a rapid increase of the fungoid growths. It is sufficient in order to increase the fungoid growths to take wort which is filtrated and pasteurized, and the sugar of which is about two thirds fermented. This wort will be hereinafter described. 30

Good fermenting fibre can be taken from the vats as required.

Very good beer yeast may also be employed for promoting healthy fungoid growths upon the clean fibres, it is preferable however not to resort to this practice, as fungoid growths deriving their germs from the air are purer and more easily obtained than any other. 35

When it is desired to ferment wines, fruit wines, champagne or effervescing beverages by means of the said fermentation fibres, the process is the same, that is to say, the sugar-containing wine, fruit-wine, or liquid which is to be fermented, is poured over the vegetable fibres, and, when a suitable temperature is obtained as above stated, the wine fungoid growths are formed in the same manner as the beer fungoid growths and the fibres can be used for fermenting any of these liquids. The use of these fibres need not further be described, as effervescing beverages are generally fermented with the same partly in their own bottles and partly in vessels the latter being the case in the manufacture of artificial mineral-waters. The separation at the proper time of this ferment is more easily performed by using a small bag containing the said ferment. The fermentation of the wort may be effected with a small or a large quantity of the above described ferment, as has heretofore been the case when using yeast. It has been found by experience that a quantity of compressed fibres equal to 1 per cent of the weight of the wort employed is a small quantity whereas 10 per cent is a rather large one. Neither of these two quantities have given rise to any inconvenience but from 2 to 4 per cent is about the proper quantity to use. 40 45 50 55

It is of great importance that the fermentation should commence quickly so that the wort should not deteriorate. For this reason the proper quantity of ferment

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has added to it from four to six times its weight of wort the wort having been cooled down to from 24 to 30 degrees Celsius. When after a few hours an active fermentation has commenced the rest of the wort cooled down to 5 or 6 degrees Celsius is added to the mass.

- 5 The period of time required to accomplish this fermentation process is (independent of the time of fermentation of filtered wort which is mentioned below) the same as for the fermentation by means of yeast, the temperature being also the same. As the sugar is being decomposed the new ferment causes the heavy yeast to precipitate at the bottom; at a low temperature of fermentation
10 the latter remains two or three days before it is decomposed. The removal of this newly formed yeast before its own decomposition commences is of great importance with regard to the purity and good taste of the beer, and consequently filtration is the operation which fulfils best this object. When the beer is simply fermented by this process but not filtered, it is purer and better than that
15 fermented by ordinary methods. But the removal of the yeast or deposit by filtration renders it still better, more brilliant and more durable, effects a saving in the quantity of ice required for cooling, and takes moreover a shorter time for fermentation than heretofore.

- The yeast or deposit which settles partly upon the fermentation fibres is
20 advantageously (but not necessarily) washed away with the filtered wort in part fermented, from the said fibres; (the mash is then filtered and the clean beer obtained is fermented anew with the clean fibres.)

The proper time at which the cleaning should be effected is when from 3 to 4 per cent of the sugar is decomposed

- 25 The principle of employing a non-nitrogenous ferment and promptly expelling all nitrogenous substances which may separate, furnishes a brilliant fermentation and consequently gives very good results.

- The next advantage results from being able to carry out the fermentation of the clean fermenting wort at a higher temperature than heretofore, without any
30 disadvantage being attached to it; highly concentrated wort after a further decomposition of about 3 per cent of sugar can be refiltered. (That is to say the nitrogenous substances which have meanwhile separated can be removed.) It is easy in carrying out the above described process to raise the temperature of fermentation to from 10 to 15 degrees Celsius and to reduce the time of
35 fermentation to five days.

- Another result of the above described cleaning is that the fermented beer clears quicker, becomes more brilliant, sparkles much more retains its carbonic acid much longer, when poured out, than heretofore, and is, on account of its purity and durability, very suitable for export. As soon as the aerometer shews that a
40 suitable specific gravity has been obtained the fermentation fibres are removed, thus the further decomposition of sugar can be easily stopped. This work is much simplified by placing the washed fermentation fibres in suitable bags. These bags float being supported by the evolution of carbonic acid, whereas the nitrogenous substances produced and which are separated by this ferment sink to the bottom.
45 The fermentation fibres which are fairly clean under these circumstances or which are washed and heated for the purpose of cleaning may in the majority of cases be forthwith used in the fermentation of fresh wort as the first fungoid growths produced can be used for several fermentations and only require a new formation from time to time.

- 50 The above mentioned filtration which is performed by a filtering press allows any quantity of wort to be easily cleaned and at the same time allows for the precipitation of yeast for any other purposes.

- When the wort, concentrated so as to contain from 25 to 30 per cent of sugar and 3 or 4 per cent of that sugar, is decomposed by the new ferment, the yeast is
55 filtered off, and concentrated wort is further added, fermented and filtered; this is repeated several times as above stated when, at the end of the operation and at a high temperature, a beer still fermenting is obtained, which is extremely pure,

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brilliant and sparkling, and which on account of the great quantity of spirits of wine which it holds contains still a large quantity of sugar. This beer diluted with water may serve advantageously for the formation upon the fibres of the fungoid growths the germs of which are derived from the air.

In the use of this principle, that is to say the precipitation of the substances containing yeast by fermentation, it is necessary that this deposit should be removed by repeated filtration before these substances are decomposed. Further fermentation with fibres, has been found highly advantageous for the must of wines and fruits, these musts can be brilliantly fermented with the use of the fibres and more or less wine can be produced for bottling.

These fermentation fibres may be most advantageously used to easily re-ferment either diseased wine, with the addition of sugar containing wine concentrated must or sugar, or diseased beer, with the addition of wort and afterwards clarifying the same by the said fermentation

Having thus fully described the said invention as communicated to me by my correspondent and the manner of performing the same I wish it understood that I claim.

First. The method hereinbefore described of preparing vegetable fibres of all descriptions as ferments, and the employment of the said prepared fibres for the decomposition of the different kinds of sugar for the production of alcohol and carbonic acid in the manufacture of beer, wine, champagne and other beverages usually charged with carbonic acid, and for promoting the re-fermentation of beer, wine, and fruit-wine.

Second. The filtration of the beer, wort, wine or fruit must, whereby the yeast-containing substances precipitated by means of the fermentation fibres, are separated from the said wort or must.

Third. Washing and heating the fibres for the purpose of cleaning the fungoid growths in order to be able to use the said fibres again for fresh fermentations.

In witness whereof I the said Frank Wirth have hereunto set my hand and seal this Thirty first day of December in the year of our Lord One thousand eight hundred and eighty three

FRANK WIRTH (L.S.)

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